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Hiramatsu et al.

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[45] **Date of Patent: Mar. 10, 1987**

[54] **APPARATUS FOR SETTING A WORKPIECE CORRECTLY ON A SEWING MACHINE**

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[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**[4] **D05B 3/12**
[52] **U.S. Cl.** **112/114**
[58] **Field of Search** 112/114, 104, 70, 74, 112/76, 121.26, 121.27

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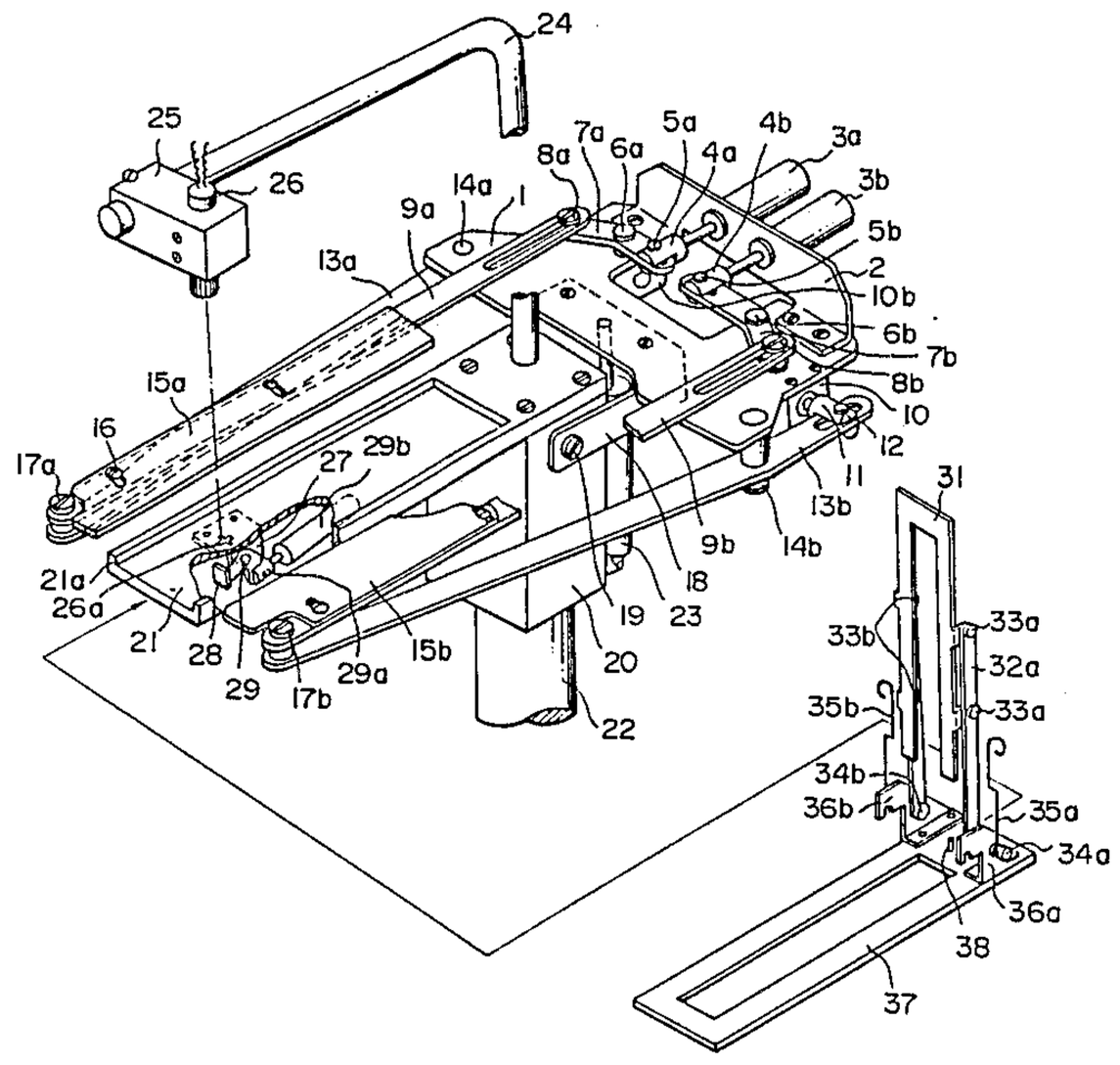
Primary Examiner—H. Hampton Hunter
Attorney, Agent, or Firm—Morgan & Finnegan

[57] **ABSTRACT**

An apparatus for setting a zipper and a front cloth to sew in correct position providing a pair of set-plates which perform three dimensional motion: vertical swing to clamp a workpiece and horizontal swing to form a "V" shape to receive a slitted front cloth and forming parallel lines to locate the zipper and the front cloth in the correct position. The motion of the set-plates is driven by air cylinders actuated by a pedal switch.

1 Claim, 23 Drawing Figures



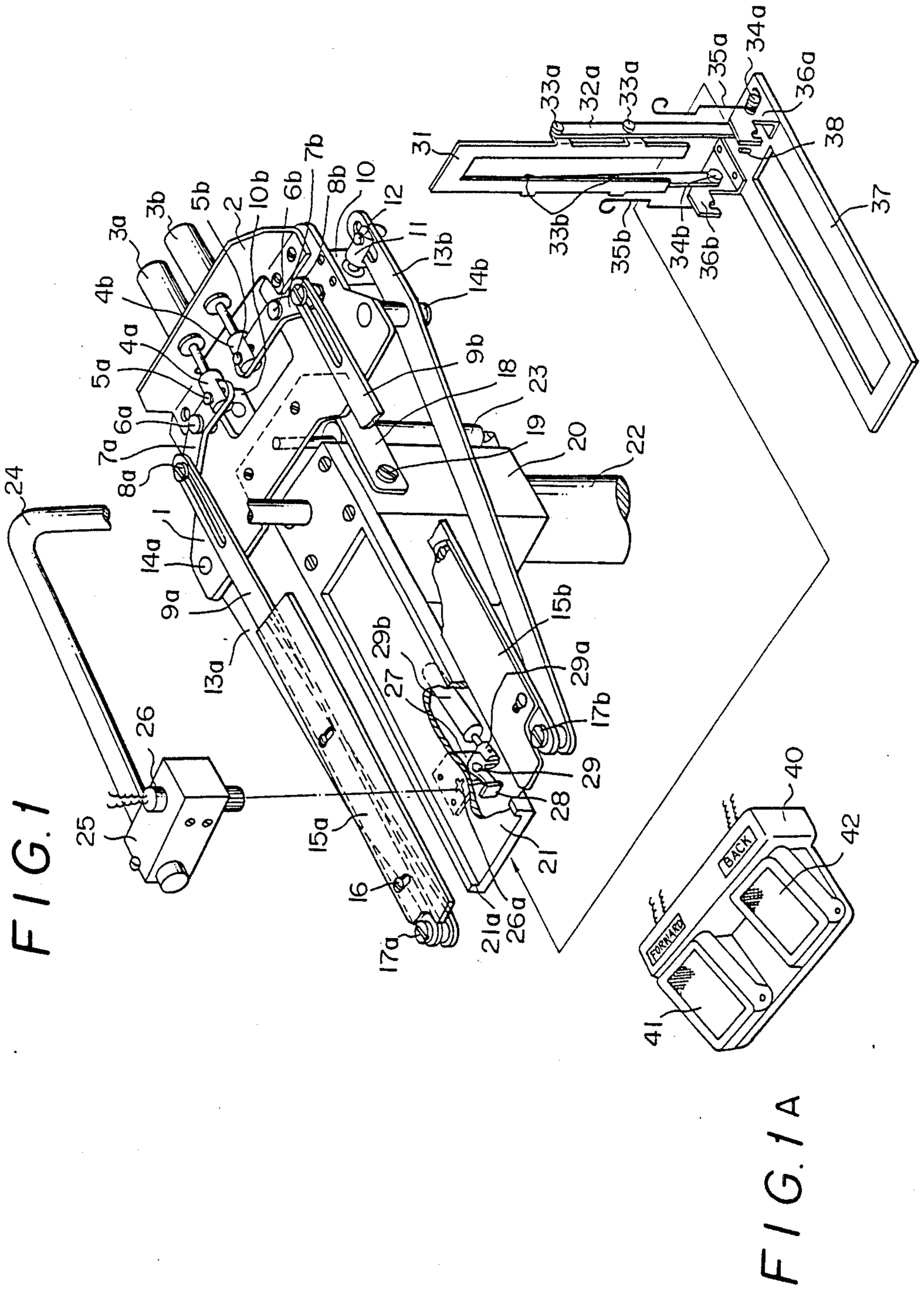

31
33a
32a
33a
35a
34a
36a
38
37
33b
35b
34b
36b
24
26
25
1
14a
9a
13a
15a
16
17a
2
3a
3b
4a
4b
5a
5b
6a
6b
7a
7b
8a
8b
10
10b
11
12
13b
14b
9b
18
23
19
20
22
15b
29b
27
29a
17b
29
28
21
21a
26a

FIG. 1

40
42
BACK
FORWARD
41

FIG. 1A

FIG. 2

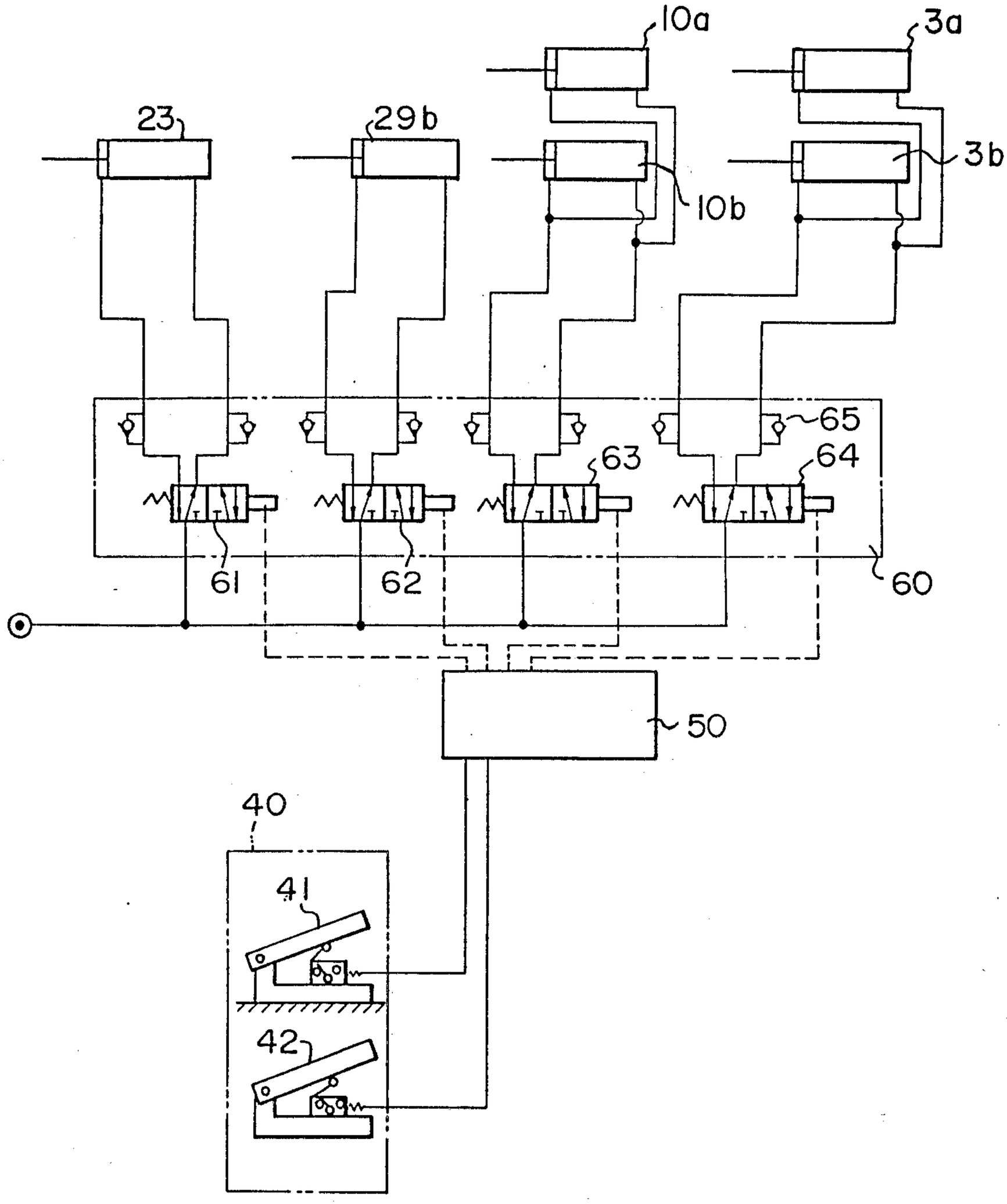


FIG. 3

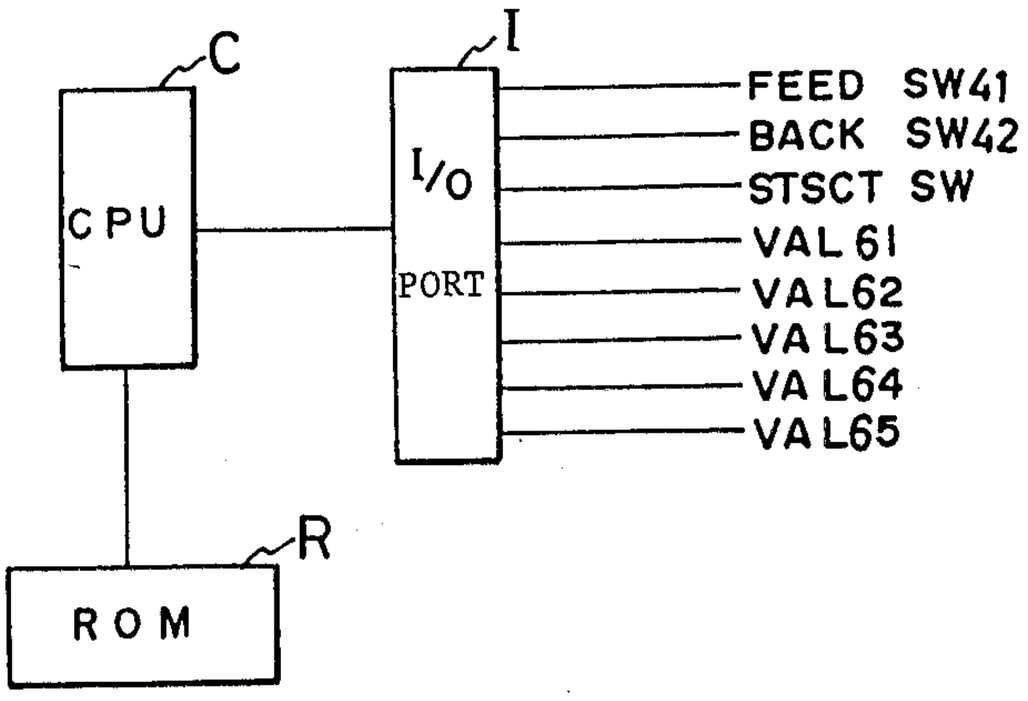

C
I
CPU
I/O
PORT
FEED SW41
BACK SW42
STSCT SW
VAL 61
VAL62
VAL63
VAL64
VAL65
R
ROM

FIG. 5

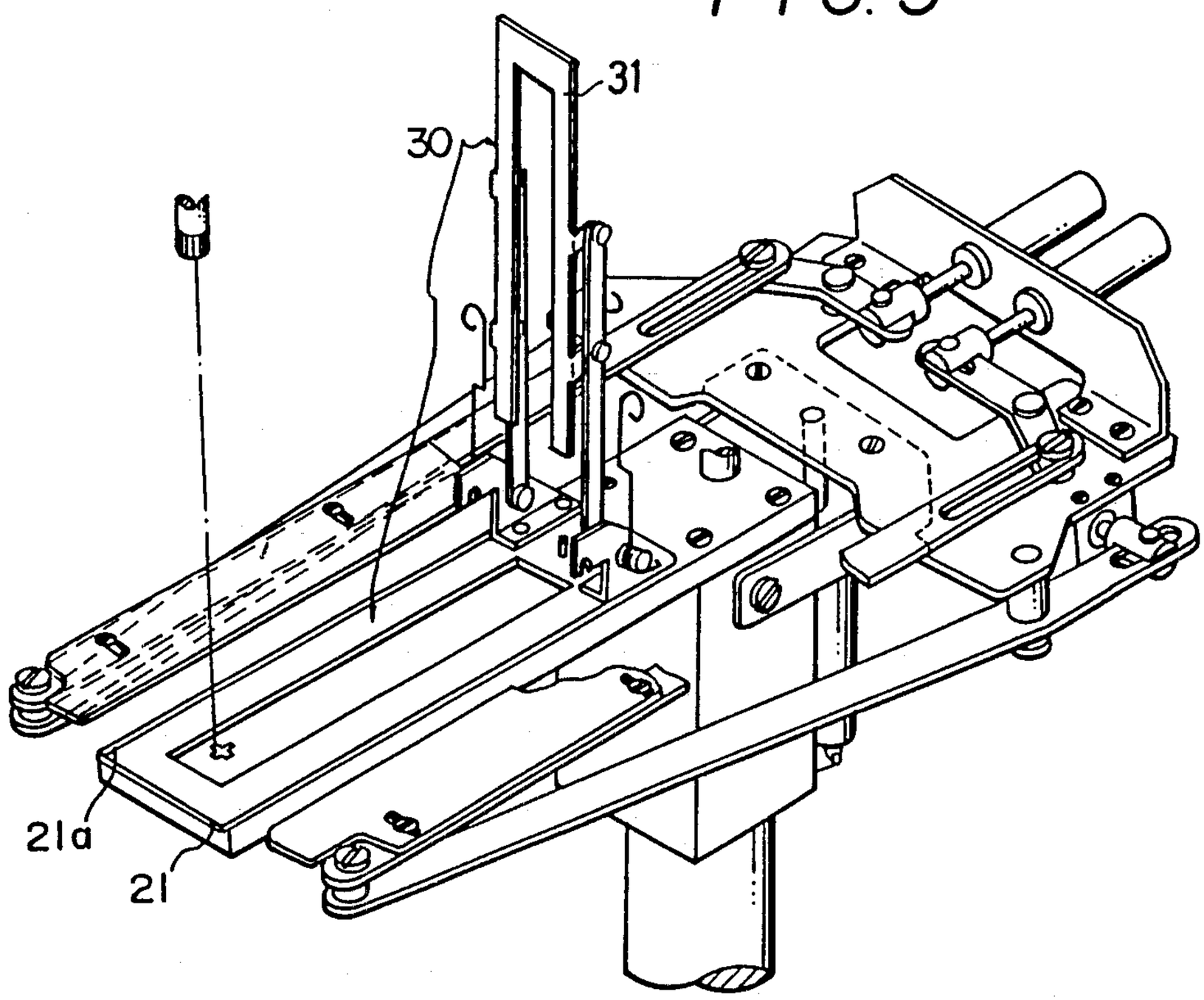

31
30
21a
21

FIG.4

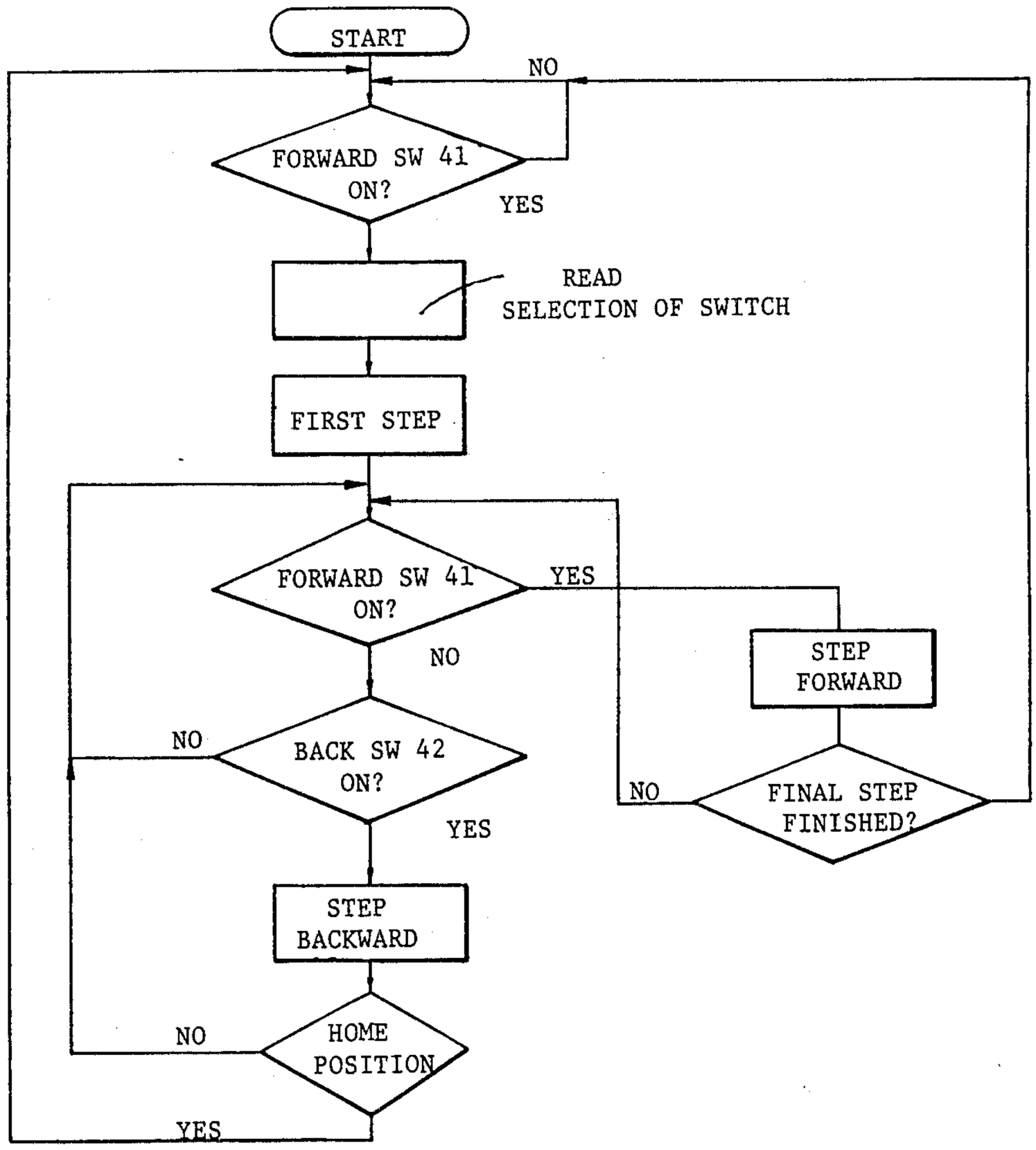

START
NO
FORWARD SW 41 ON?
YES
READ SELECTION OF SWITCH
FIRST STEP
FORWARD SW 41 ON?
YES
STEP FORWARD
NO
FINAL STEP FINISHED?
NO
BACK SW 42 ON?
NO
YES
STEP BACKWARD
HOME POSITION
NO
YES

FIG. 6

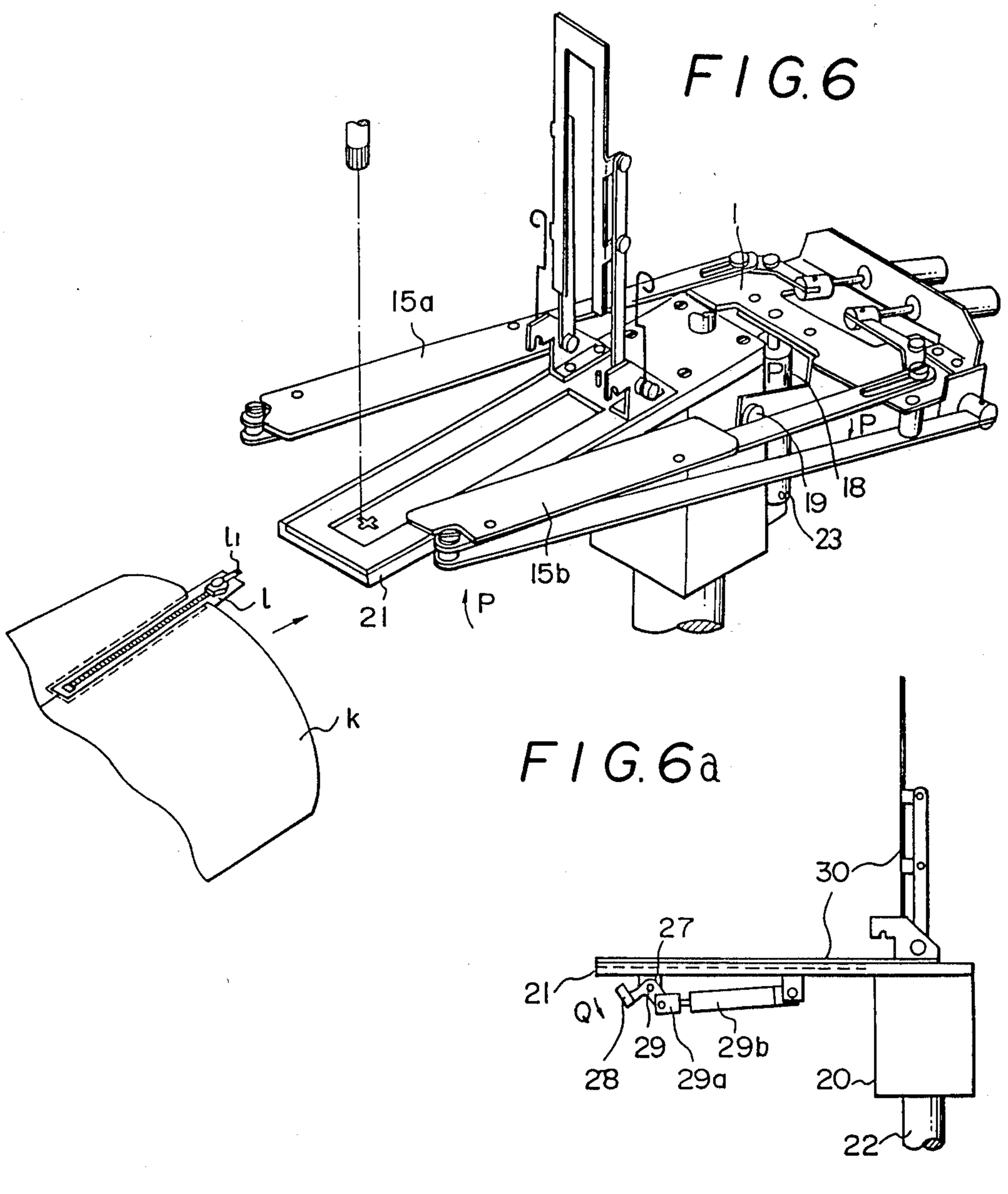


FIG. 6a

FIG. 7

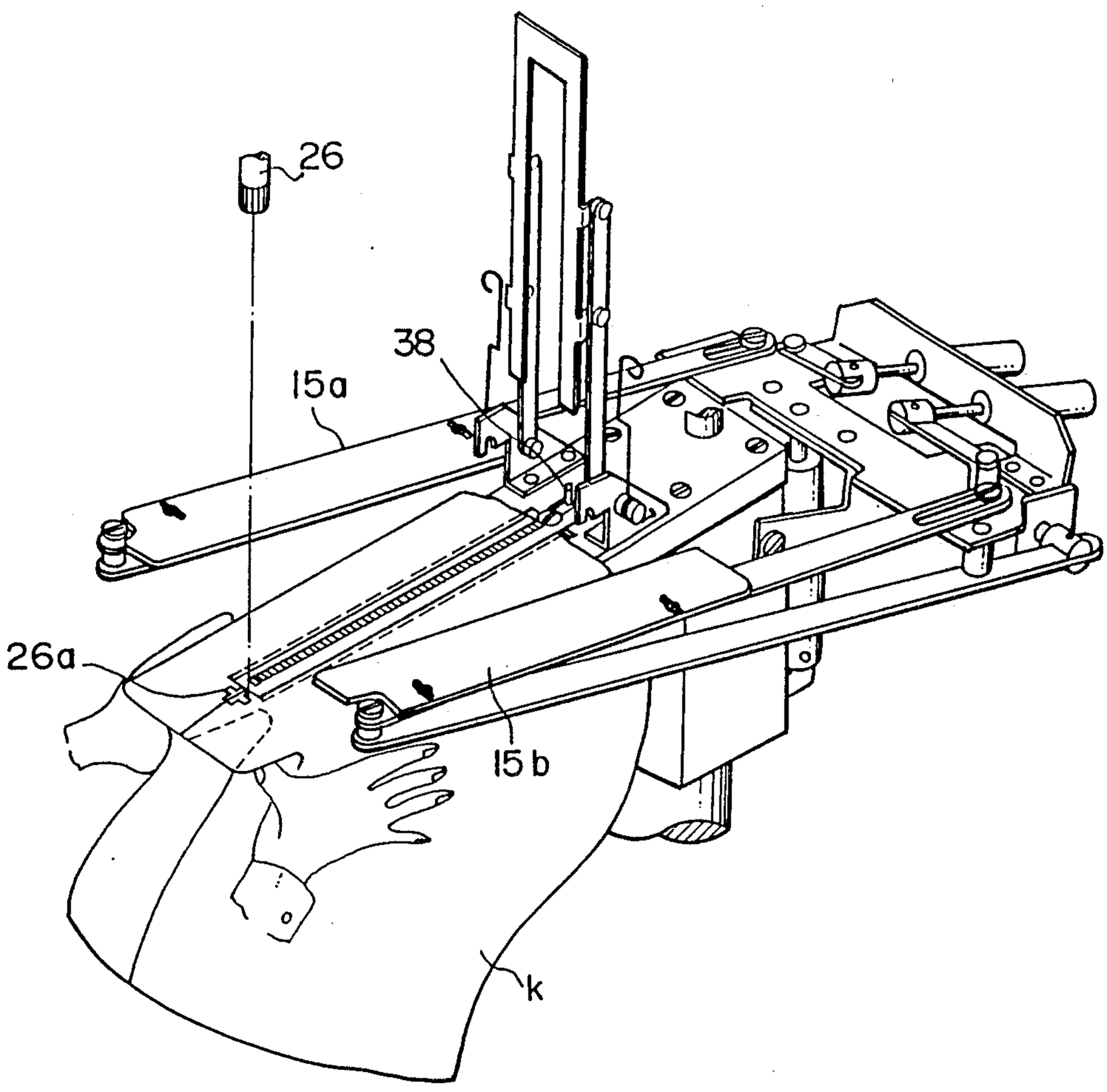


FIG. 7A

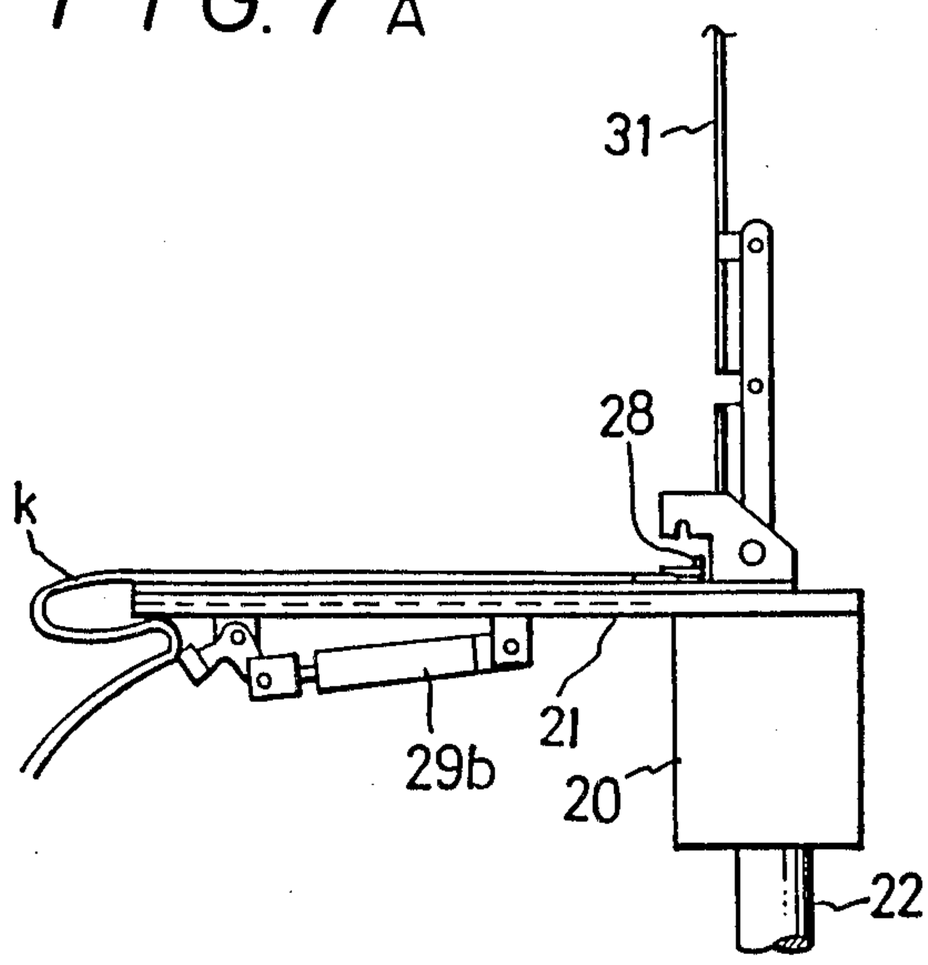
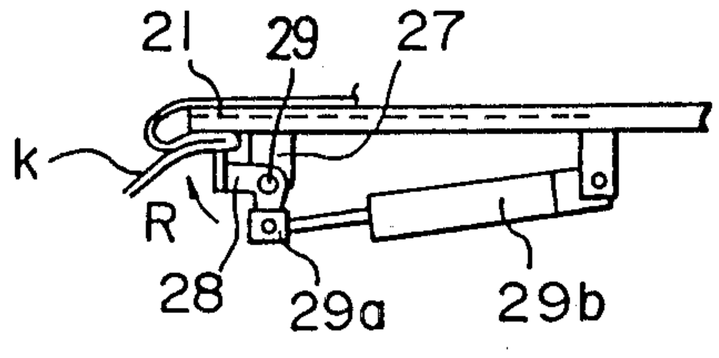


FIG. 7B



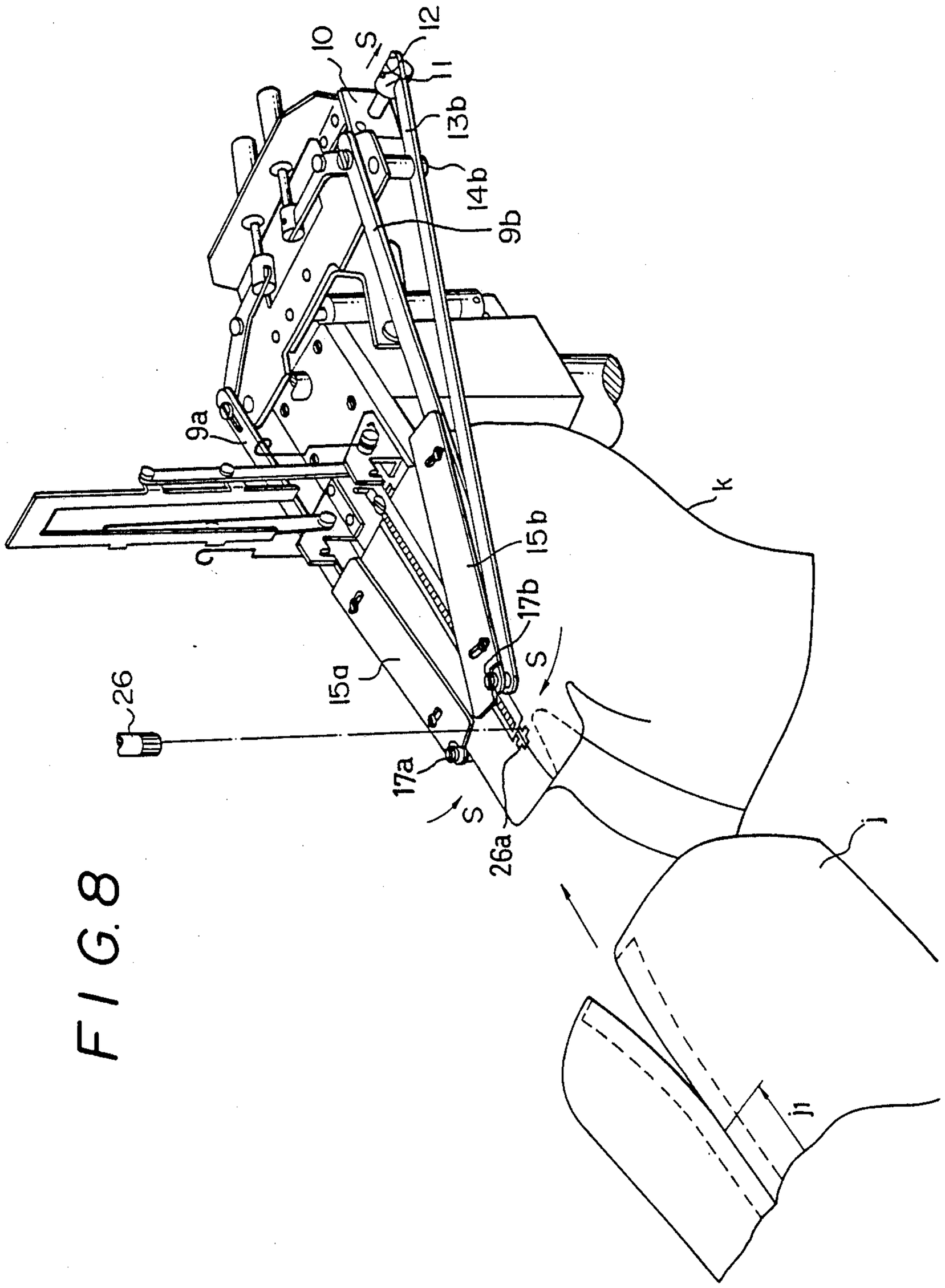
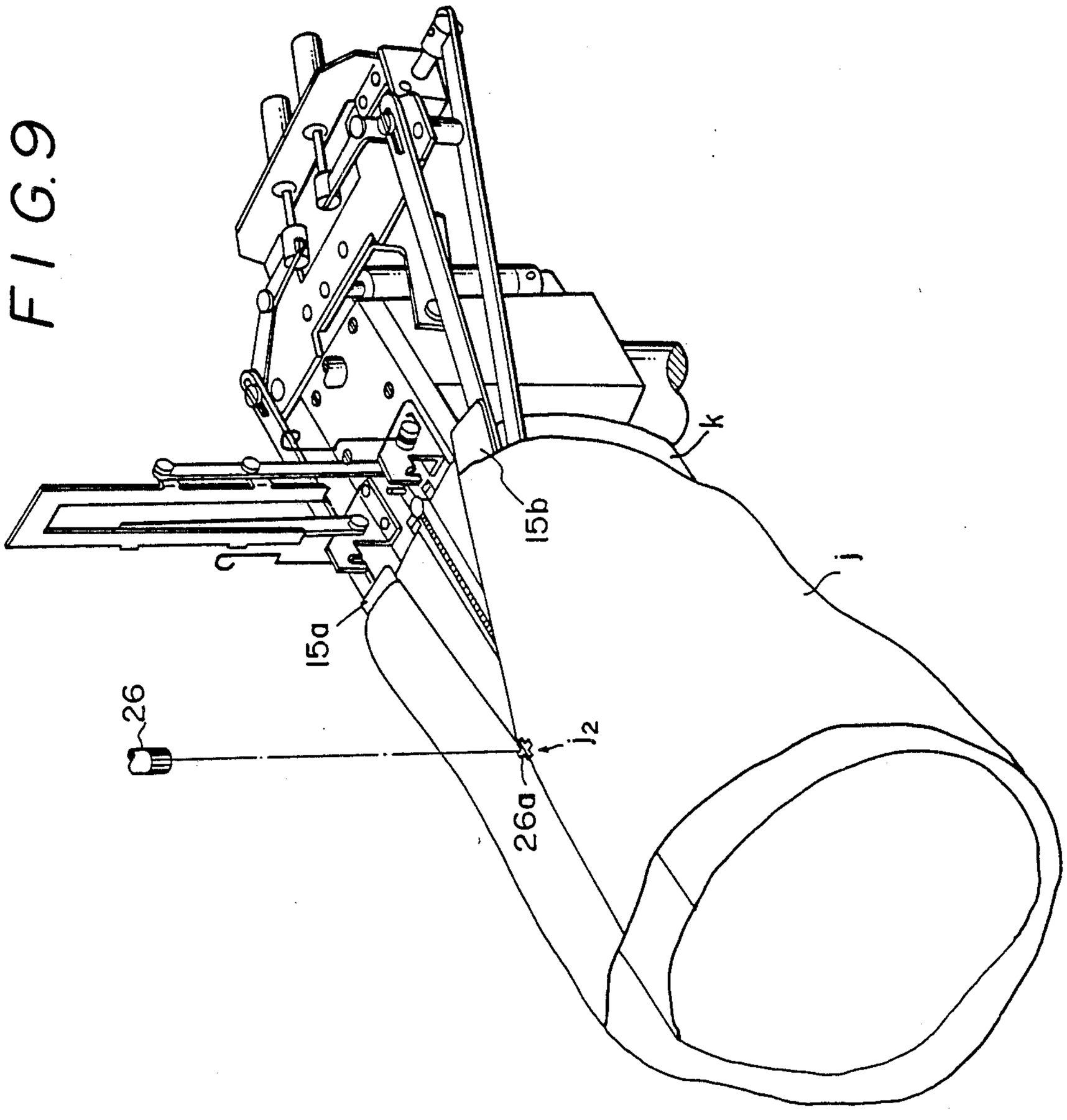


FIG.8

FIG.9



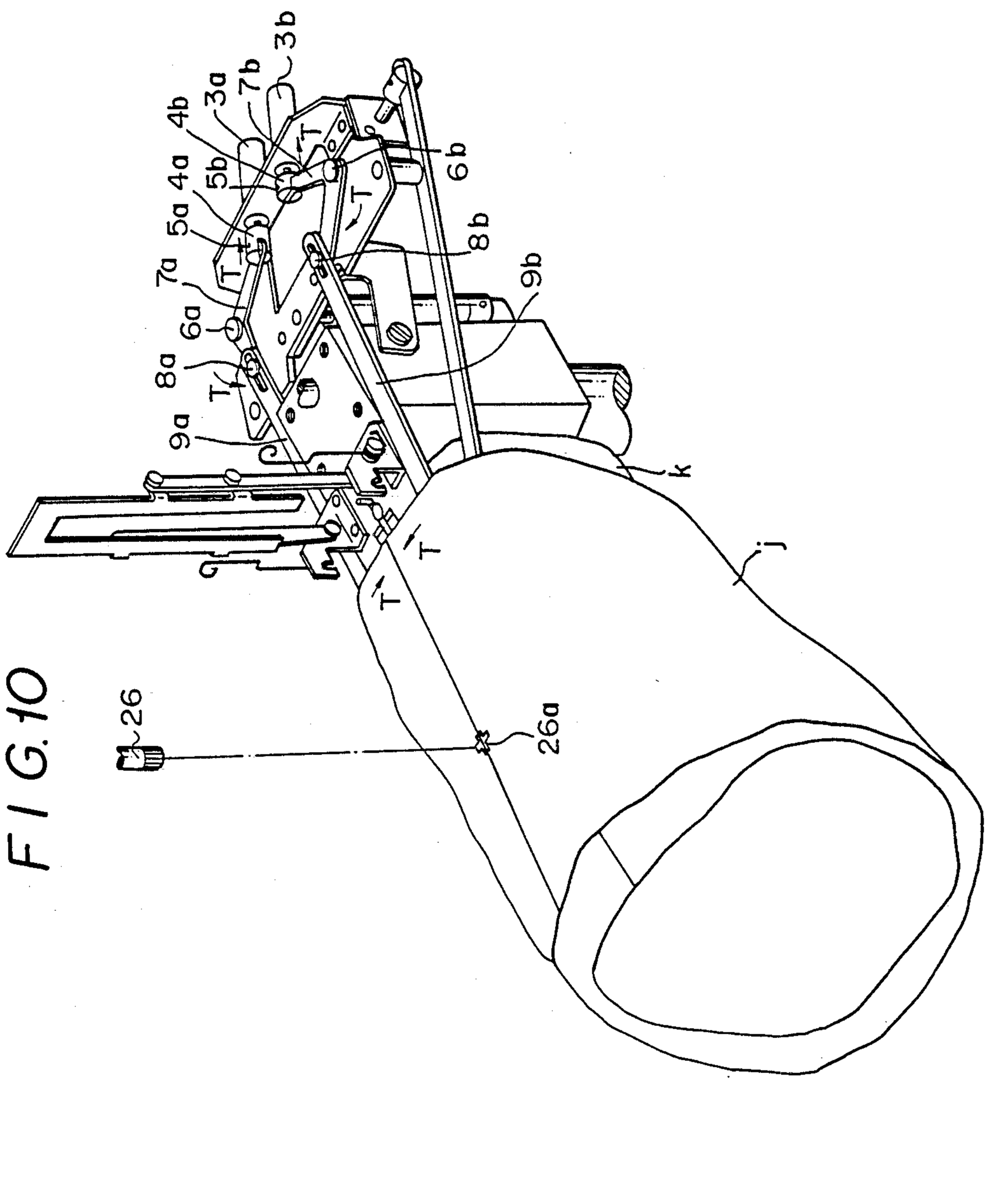


FIG.10

FIG.11

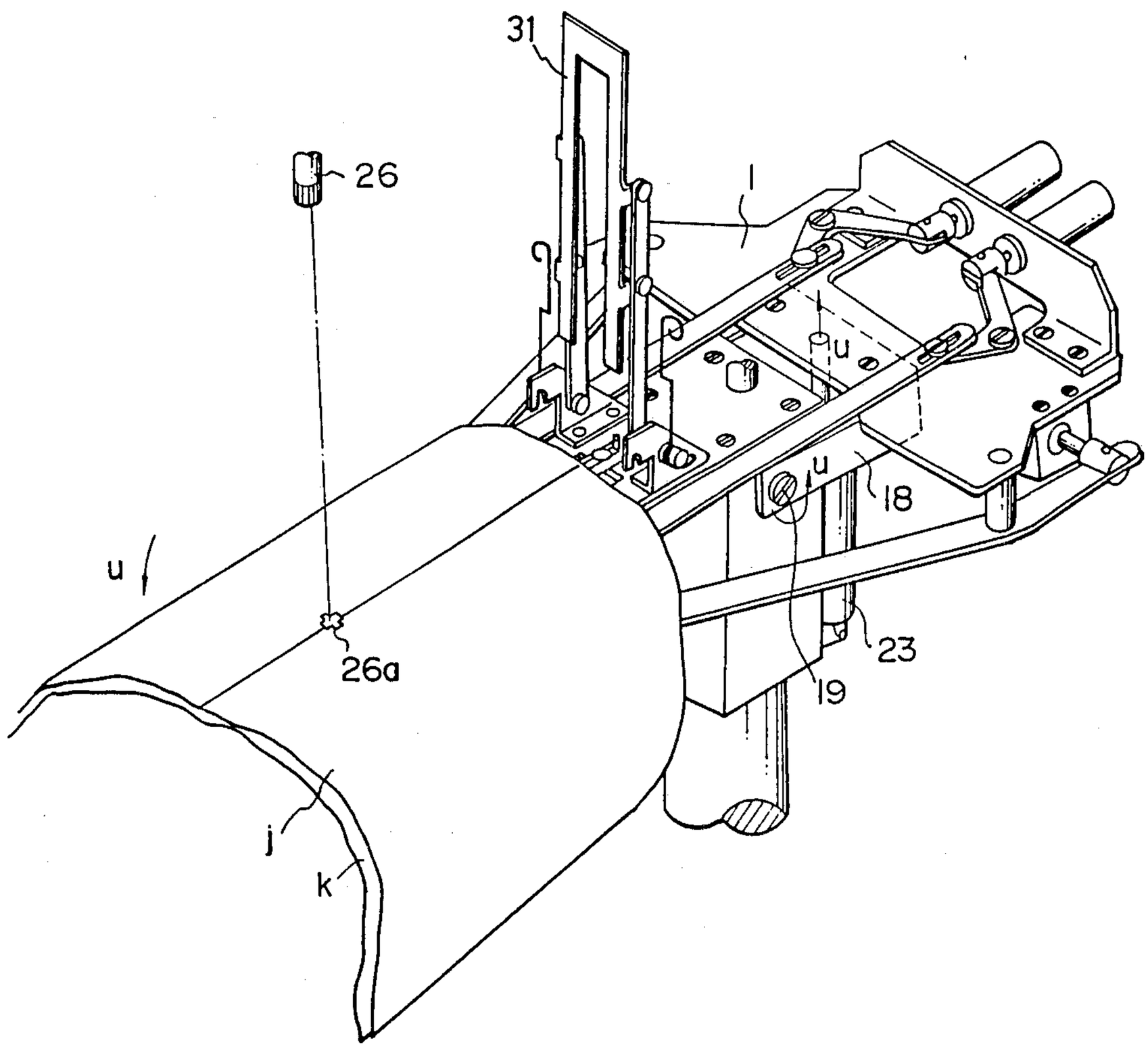


FIG.12

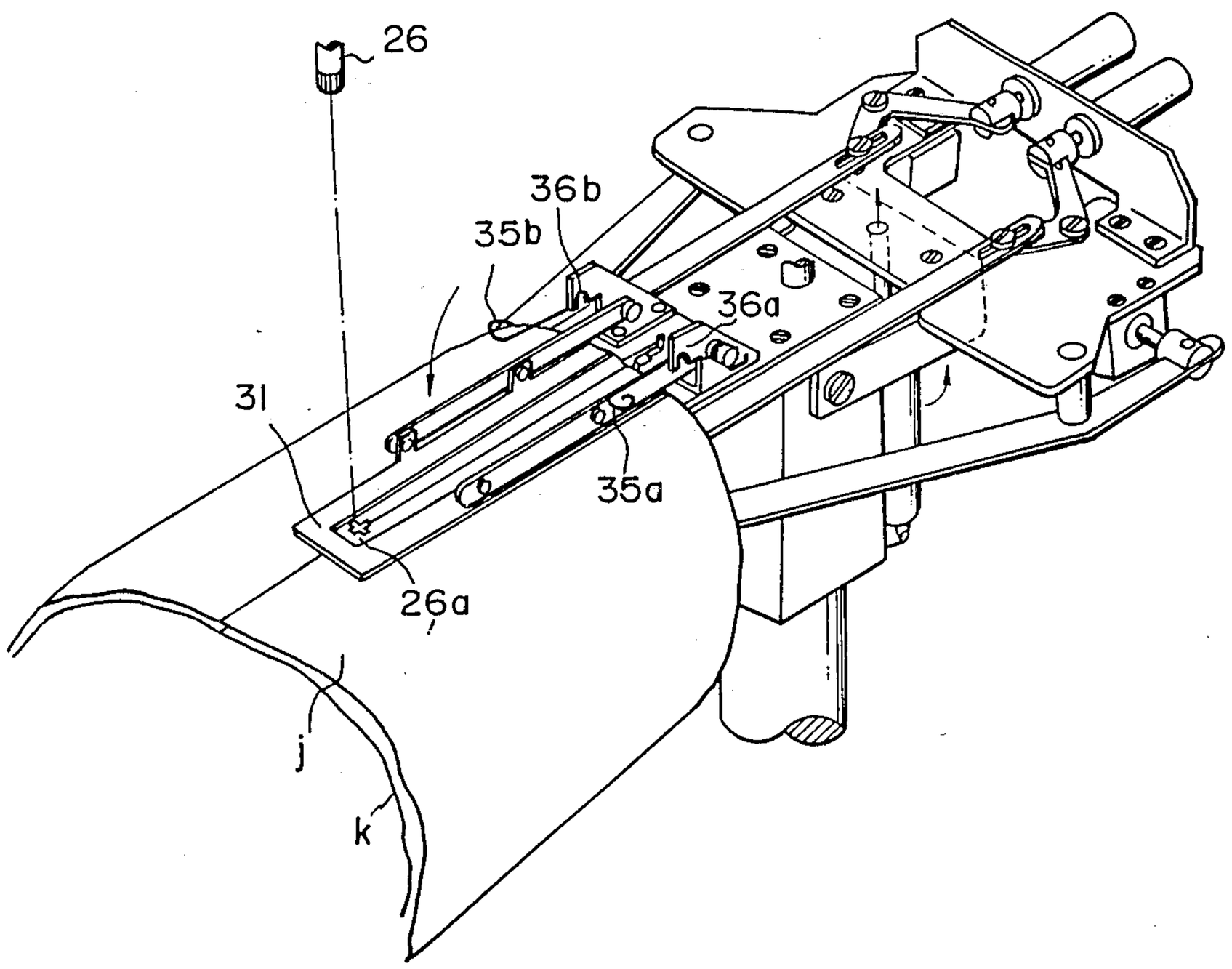


FIG.13

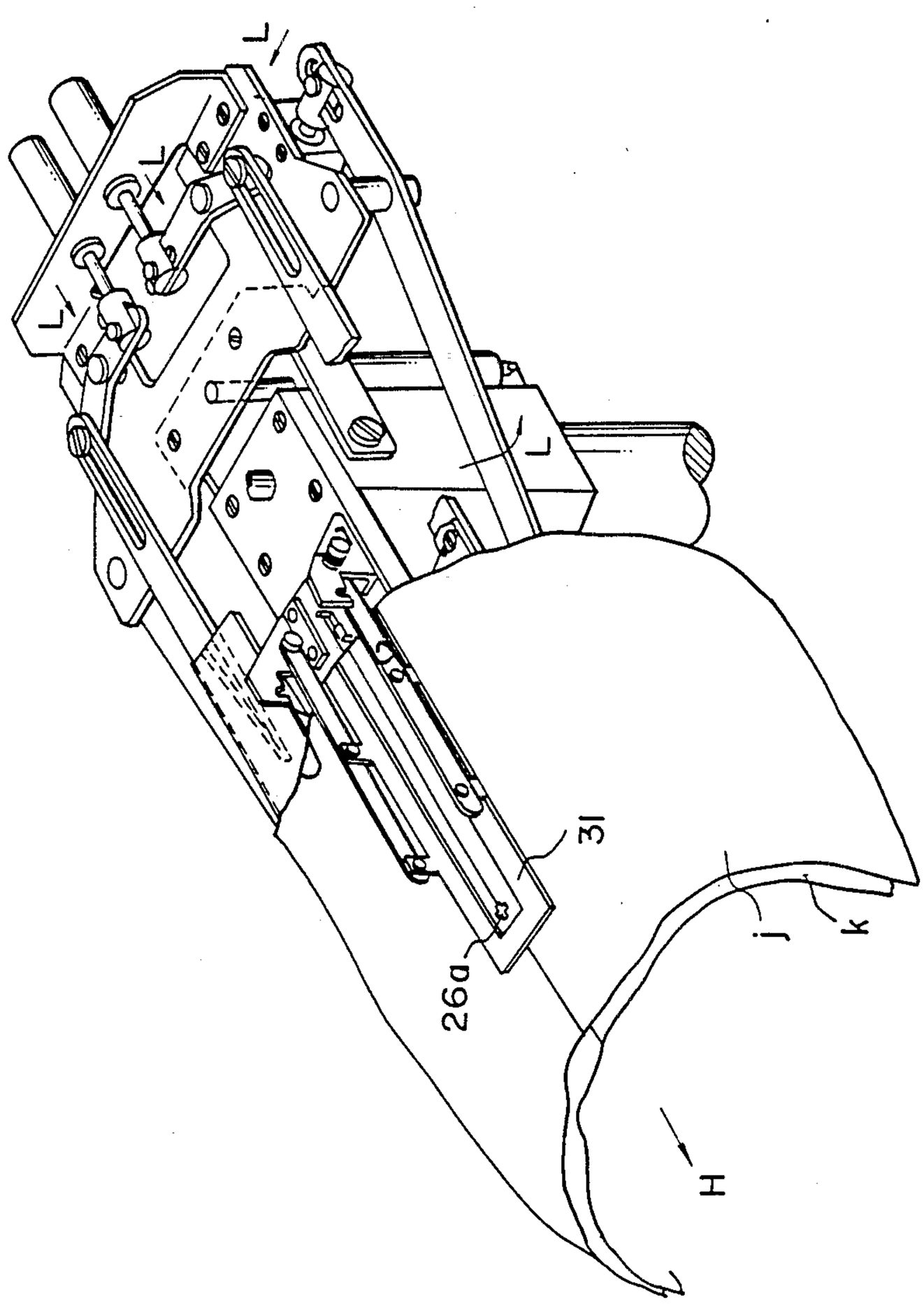


FIG. 14

PRIOR ART

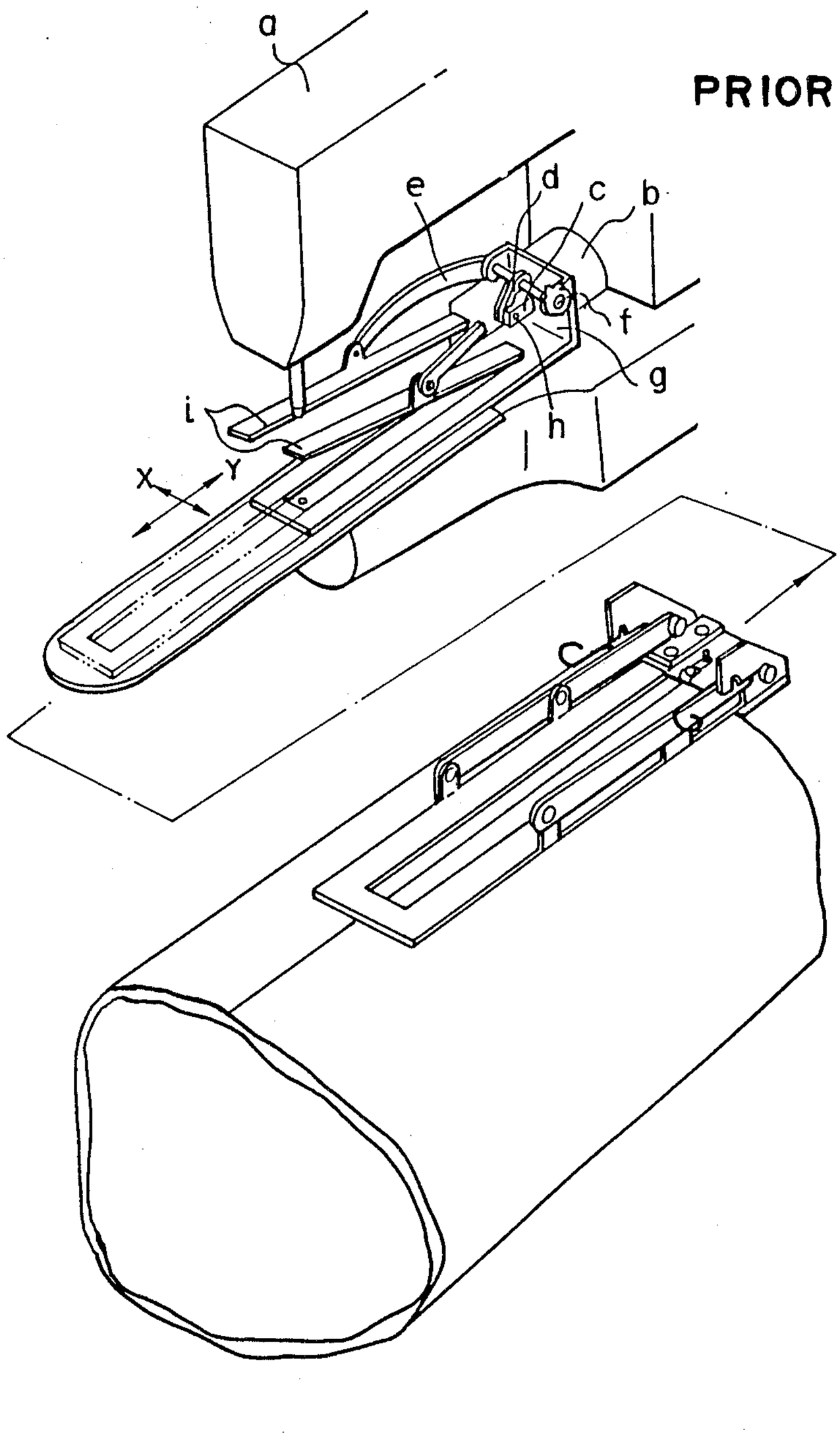


FIG. 15

PRIOR ART

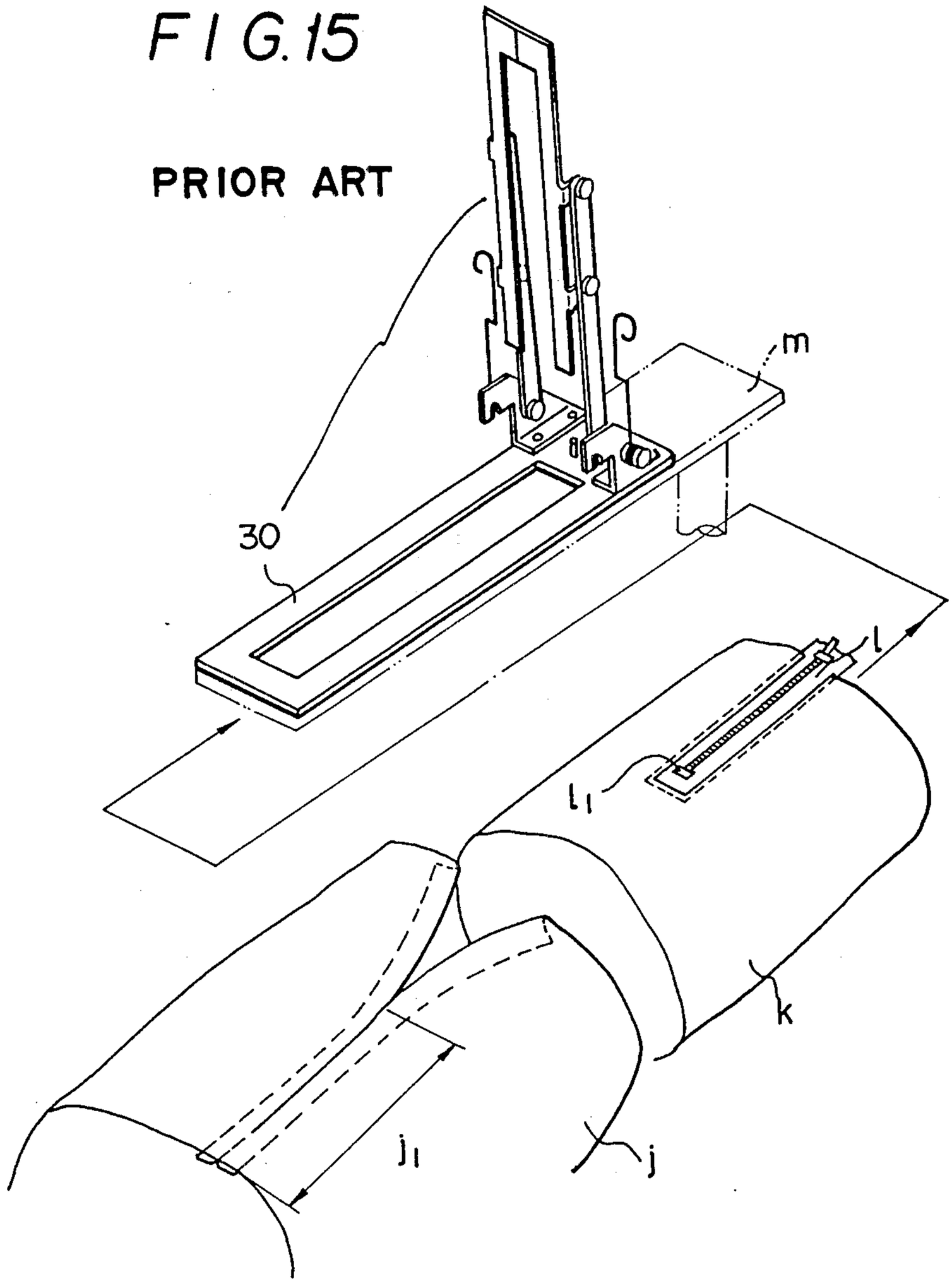


FIG. 16A

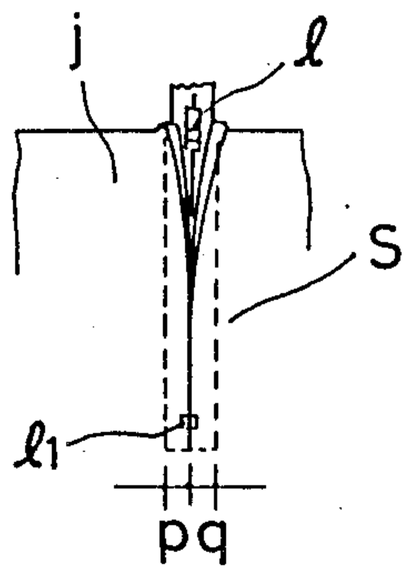


FIG. 16B

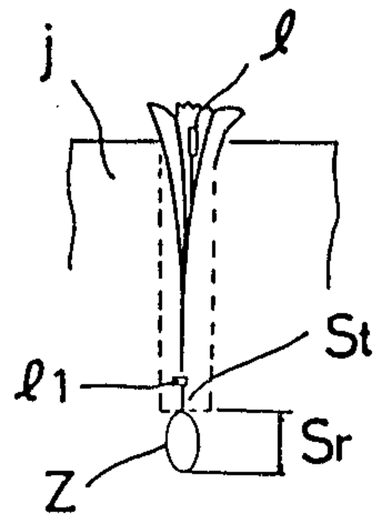


FIG. 17

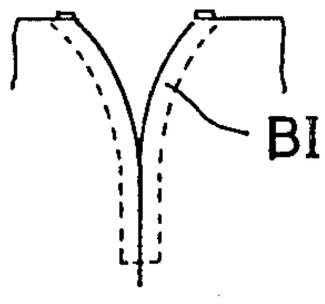
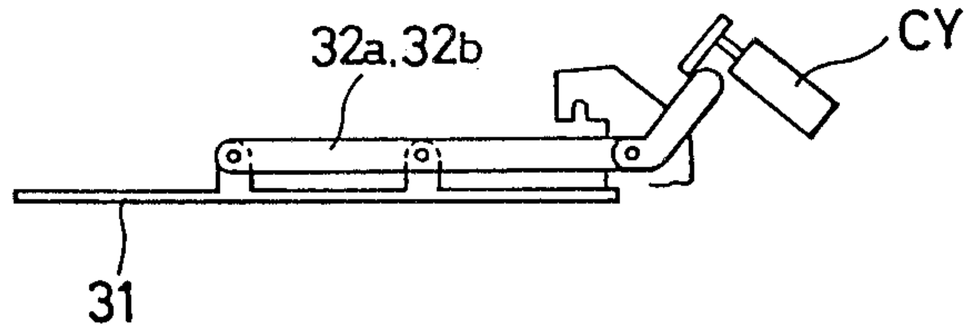


FIG. 18



APPARATUS FOR SETTING A WORKPIECE CORRECTLY ON A SEWING MACHINE

BACKGROUND OF THE INVENTION

This invention relates to a sewing machine specially designed to stitch a zipper to fabrics and more particularly to an apparatus for positioning a zipper in correct position.

When a zipper is to be stitched to the fabric of a skirt, the zipper is first stitched to a fabric lining cloth and then this lining fabric and a front cloth material are sewed together. During this process, the positioning of the lining cloth and the front cloth material is very important since this positioning influences the final grading of stitch work. Therefore, the positioning work requires precision work and several manufacturing steps. To avoid such precision work and manufacturing steps, many kinds of automatic zipper sewing machines have been developed.

FIG. **14** and FIG. **15** illustrate how the conventional zipper sewing machine works when the zipper is being sewed to the skirt. Referring to FIG. **14** and FIG. **15**, "a" denotes a sewing machine, "k" denotes a lining cloth with a zipper "l" previously sewed therewith, "j" denotes a front cloth, "j_1" denotes a sewed portion of the front cloth, and the numeral **30** denotes a casset-set.

At first, the casset-set is placed on a table "m". The lining cloth k with the zipper l previously sewed therewith and the front cloth j are set on the casset-set **30** manually. After clamping the fabric with the casset-set **30**, the casset-set is placed on a feeding table "g" of a sewing machine a. An air cylinder "b" is installed on the feed table g and air is supplied to plunger side of the cylinder. The plunger is drawn, and resultantly, a pair of foot presses "i" the casset-set **30** through linkage motion via a shaft "f", a lever "d", and a pressing arm "e". The sewing machine a is then driven by an automatic X-Y coordinate driver (not shown) in direction of X and Y accordingly, and thus the front cloth and the lining cloth k are sewed together.

According to conventional procedures, the front cloth j and the lining cloth k are set manually relying on the human eye. Thus, it is difficult to secure correct positioning and time is wasted in the process. In some cases, the zipper is not symmetrically positioned relative to the center line and therefore the distances p, q (refer to FIG. **16***a*) are not equal. When the difference is beyond a certain degree, the needle strikes the stopper l_1 of zipper l and the needle is often broken.

Referring to FIG. **16***b*, if the position of the already sewed portion Sr does not coincide with the position of center line of the zipper, the portion z as shown in FIG. **16***b* is wrinkled.

SUMMARY OF THE INVENTION

With the foregoing in mind, it is an object of the invention to provide an apparatus for rapidly setting a front cloth and a lining cloth in the correct position when a zipper is to be sewed and thereby saving time spent over conventional positioning work by application of the apparatus.

According to this invention, a pair of parallel positioned setting plates are pivoted at one end so that the other end of the setting plates move up and down and the setting plates may be narrowed into a "V" shape formation. Thus, the apparatus is adapted to perform three dimensional action (move up, move down, narrow) and such action is effective to achieve the purpose of this invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, referred to herein and constituting a part hereof, illustrate a preferred embodiment of the invention and, together with the description, serve to explain the principles of the invention, wherein:

FIG. **1** is a perspective view of one embodiment of this invention.

FIG. **1***a* is a perspective view of a pedal switch used in the embodiment of FIG. **1**.

FIG. **2** is an air pressure circuit diagram according to the embodiment of FIG. **1**.

FIG. **3** is conceptual control block diagram according to the embodiment of FIG. **1**.

FIG. **4** is an operational flow diagram according to the embodiment of FIG. **1**.

FIG. **5** through FIG. **13** illustrate various aspects in the operation of the invention.

FIG. **14** and FIG. **15** show conventional procedures for setting a workpiece to sew a zipper to the workpiece.

FIG. **16A** and FIG. **16B** illustrate conventional problematic points.

FIG. **17** shows a skirt wherein this invention is applied.

FIG. **18** shows another embodiment of a casset-set with some modifications therein.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring to the accompanying drawings, one prefered embodiment of this invention will be explained hereinafter. FIG. **1** is a perspective view of a preferred embodiment of the material setting apparatus according to this invention, showing essential parts therein. Some portions are shown in partially cut section views.

At first, construction of this preferred embodiment will be explained. A casset table **21** is fixed on a table **20** located on top of a support column **22** standing on a base (not shown). A pair of set-hinges **18** are placed facing around the table **20** and are pivoted on a shaft **19**. At the other end of the set-hinges **18**, an install-plate **1** is provided. A pair of link levers **7***a*, **7***b* are positioned symmetrically about the center line of the install-plate **1** and each is pivoted on pins **6***a*, **6***b* respectively. The inner ends of link levers **7***a*, **7***b* are pivoted on shafts **5***a*, **5***b*, respectively, and are connected to plungers **4***a*, **4***b* of air cylinders **3***a*, **3***b* respectively. The outer ends of link levers **7***a*, **7***b* are pivoted to shafts **8***a*, **8***b* and these shafts **8***a*, **8***b* slidably pass through oblong holes provided at link lever **9***a*, **9***b*. The cylinders **3***a*, **3***b* are fixed to a cylinder support **2** which in turn is fixed to the install plate **1**.

On each link lever **9***a*, **9***b*, set-plates **15***a*, **15***b* are fixed by screws **16** and thus the set-plates **15***a*, **15***b* are positioned in parallel. The other end of link levers **9***a*, **9***b* are pivoted on shafts **17***a*, **17***b* which connect rotatably the link levers **9***a*, **9***b* to the end of set-levers **13***a*, **13***b*. The other end of set-levers **13***a*, **13***b* are pivoted on shafts **12** which are connected to a set-cylinder **10***a* (not shown) and **10***b*, respectively, via plungers **11***a* (not shown) and **11***b* respectively. The middle portion of set levers **13***a*, **13***b* are pivoted on shafts **14***a*, **14***b* which connect to the

install-plate **1**. (Thus the set-levers **13***a*, **13***b* are pivoted on each side of the install-plate **1**)

On the casset table **21**, a channel **21***a* is provided to install the casset-set **30**, and at the back-side of the casset table **21** a bearing **27** is provided to support a hinge **29** and a lining cloth presser **28** is pivoted on the bearing **27**. One end of the cloth presser **28** is connected to a plunger **29***a* of the cylinder **29***b* which presses the lining cloth. A mark light pole **24** is provided at upper side of the casset table **21**. At the end of the horizontally extending pole **24**, a mark light **26** is provided, and this mark light **26** projects a spot mark **26***a* on the casset table **21**.

In the casset-set **30**, a presser plate **31** is sustained by a pair of material press levers (right, left) **32***a*, **32***b* by shafts **33***a*, **33***b* respectively. The lower end of the material press levers **32***a*, **32***b* are pivoted on shafts **34***a*, **34***b*. Numerals **35***a*, **35***b* denote springs which are hooked on semi-circular notches at lever holding plates **36***a*, **36***b*, and these springs press the front cloth j. Numeral **38** denotes a pin which will be inserted into a slider's hole to guide and position a zipper.

FIG. **1***a* shows a pedal switch **40** used for this embodiment and comprises a forward switch **41** and a backward switch **42**.

FIG. **2** is an air pressure circuit diagram for FIG. **1**. Numeral **50** denotes a controller, and the commands from the switches **41**, **42** energize the pressing cylinder **23**, the lining cloth pressing cylinder **20***b*, the setting cylinders **10***a*, **10***b* cylinders **3***a*, **3***b* in relation with the control of solenoid valves **61**, **62**, **63**, **64**, which control these cylinders, and these solenoid valves are assembled in a solenoid valve box **60**.

FIG. **3** shows a conceptional block diagram of controller **50**. "C" denotes a CPU (central processing unit) and "R" denotes a ROM (read only memory) for sequential program. "I" denotes selective switches by the forward switch **41** and the backward switch **42** and also denotes input/output ports for solenoid valves **61**, **62**, **63**, **64** and a speed control valve **65**. FIG. **4** is a flow chart explaining operation of this embodiment.

FIGS. **5** through **13** explain the operation of this embodiment in detail based on the flow chart in FIG. **4**. Forwarding and backwarding are performed by the pedal switch **40** as illustrated in FIG. **1***a* and FIG. **3**. When the forward switch **41** is depressed, the work is advanced by one step, and when the backward switch **42** is depressed the work is backed up to one step before position.

As the first step, referring to FIG. **5**, casset-set **30** is inserted into the channel **21***a* of the casset table **21**. At this time, the material pressing plate **31** is in an open condition, then following six steps are performed:

(1) FIRST STEP (refer to FIG. **6**, FIG. **6***a*)

The forward switch **41** is pressed one time. Air flows into the rod side of the pushing cylinder **23**, the rod draws, and the install-plate **1** moves in direction of arrow "P" keeping the shaft **19** as the center. A pair of set-plates **15***a*, **15***b* are raised and positioned as FIG. **6** shows. At this time, referring to FIG. **6***a* which shows under side of the casset table **21**, air is supplied to the plunger side **29***a* of the lining cloth pressing cylinder **29***b*, and the plunger **29** is drawn, and the lining cloth pressing lever **28** is rotated in direction of arrow "Q" keeping the shaft **29** as the center.

(2) SECOND STEP (refer to FIG. **7***a*, FIG. **7***b*)

A hole of zipper slider l_1, (refer to FIG. **6**) is hooked to the pin **38**. The lining cloth k is properly set on the casset table **21**, so that the spot mark **26***a* from the mark light **26** positions at the center line of the zipper. Then, the forward switch **41** of pedal switch **40** (FIG. **1***a*) is pressed. Air is supplied to the counter-plunger side of the lining cloth pressing cylinder **29***b*, and the plunder **29***a* extends, and the lining cloth pressing lever **28** rotates in direction of arrow "R" (FIG. **7***b*) keeping the shaft **29** as the center. Thus, the lining cloth k is clamped between the back side of the casset table **21** and the lining cloth pressing lever **28**.

(3) THIRD STEP (refer to FIG. **8**, FIG. **9**)

The forward switch **41** is further pressed. Air is supplied to the counter-plunger side of the setting cylinder **10**, and the plunger extends, and the set-lever **13***b* rotates in the direction of arrow "S" (FIG. **8**) keeping shaft **14***b* as the center. (Although the other set-lever **13***a* is not shown, it moves as set-lever **13***b*).

The link levers **9***a*, **9***b* are moved in direction of "S" via the shafts **17***a*, **17***b*. Accordingly, the set-plates **15***a*, **15***b* move in direction of "S", respectively, and finally the set plates **15***a*, **15***b* form a "V" shape. Then, referring to FIG. **9** the front cloth j is placed on the "V" shaped set plates **15***a*, **15***b*, and a junction point j_2 is indicated with the spot mark **26***a*.

(4) FOURTH STEP (refer to FIG. **10**)

The forward switch **41** is further pressed. Air is supplied to the plunger side of the cylinders **3***a*, **3***b* and plungers **4***a*, **4***b* are drawn. The link levers **7***a*, **7***b* rotate the set-plates **15***a*, **15***b* in the direction of arrow "T" respectively via the shafts **5***a*, **5***b*, **8***a*, **8***b*, and the link levers **9***a*, **9***b*. The "V" shaped set-plates **15***a*, **15***b* (explained at Step 3) move to narrow the angle of the "V".

(5) FIFTH STEP (refer to FIG. **11**)

The forward switch **41** is further pressed by one step. Air is supplied to the counter-plunger side of the pressing cylinder **23**, the plunger extends, and the install-plate **1** turns in direction of "U" (FIG. **11**) via the hinge **18** keeping the shaft **19** as center. The front cloth j is pressed to the lining cloth k by the set-plates **15***a*, **15***b*.

(6) SIXTH STEP (refer to FIG. **12**, FIG. **13**)

The workpiece-press-plate **31** at the casset **30** is turned down. The ends of the springs **35***a*, **35***b* are hooked to the semicircular shaped notches provided at the lever-fixed-plate **36***a*, **36***b*, and thus the front cloth is pressed. The forward switch **41** is further pressed. The situation returns to the situation of FIG. **6** (except the workpiece-press-plate **31** is pressing the front cloth j). The front cloth and the lining cloth are positioned in correct position. Keeping the correct position of both front cloth and the lining cloth, the casset set **30** is pulled out along the channel **21***a* of the casset table **21** in direction of arrow "H" (FIG. **13**). The casset is set on the proper location in the sewing machine and sewing work starts. Stitching will be effectively performed and the zipper will be sewed in the correct position.

According to this embodiment, the required movement of set-plates **15***a*, **15***b* is performed via a four-lever linkage system, and air cylinders are used as the drive source, but it will be understood the invention is not limited to such a linkage system and drive source, and many modifications are contemplated.

For example, referring to FIG. **1**, if some small needles were provided at the surface of the workpiece-press-plate **31** to protect the workpiece from slipping, the position of the workpiece will be more correctly secured. In this embodiment, the movement of the set-plates **15***a*, **15***b* is symmetrical, but more complicated movement may be performed if more solenoid valves

for controlling air pressure are installed so that the complicatedly-shaped workpiece may be set in correct position. Additionally, this invention is applicable to a bias-cutting BI of the front cloth as FIG. **17** shows.

Referring to FIG. **18**, in this case, the material-press-levers **32***a*, **32***b* are shaped in an "L" and the springs **35***a*, **35***b* are pulling the workpiece-press-plate **31** to clamp the workpiece. Thus, by actuating the end of the material-press-levers **32***a*, **32***b* with an air cylinder CY which is operated by the pedal switch, the manual work is avoided. In the above-described embodiment, the sewing of a zipper to the skirt is described, but this invention is not limited to skirts but is applicable to pajamas or any other fabrics where the similar type of zippers are sewed.

As many apparently widely different embodiments of the invention may be made without departing the spirit and scope therein, it is to be understood that invention is not limited to the specific embodiment thereof except as defined in the appended claims.

What is claimed:

1. An apparatus for setting a workpiece on a sewing machine, comprising:

a casset table which is fixed to a table and sets a casset-set having upper and lower plates to clamp a workpiece,

an install-plate which is hinged to move up and down at said table by a horizontal shaft,

a pair of set-levers sustained horizontally and in parallel on said install-plate,

narrowing means for narrowing the ends of said set-levers to form a "V" shape,

moving means for moving said set-levers to reduce the angle of said "V" shape, and

driving means to activate said install-plate and said narrowing and moving means.

* * * * *